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Applicant..... Westinghouse Electric Corporation.

Actual Inventor..... William A. Johnston.

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Classification, 25.4.

Drawing attached.

COMPLETE SPECIFICATION.

**"IMPROVEMENTS IN OR RELATING TO METHOD AND APPARATUS
FOR CLEANING FABRICS OR THE LIKE."**

The following statement is a full description of this invention including the best method of performing it known to us:-

This invention relates to apparatus for washing fabrics and has for an object to provide an improved apparatus of this kind.

The invention is particularly applicable to washing apparatus of the tumbler type wherein the fabrics are cyclically elevated from a body of washing fluid and plunged therein while contained within a drum or basket rotating about an axis inclined substantially from the vertical. In accordance with the invention, a body of detergent solution is prepared utilizing only a fraction of the total amount of water used in the washing operation. This detergent solution is highly concentrated and has a low liquid level. The fabrics are tumbled in this solution for a predetermined period of time during which the soils in the fabrics are readily loosened because of the increased mechanical washing and scouring actions effected by the low level body of solution and by the soil

dissolving effect of its high concentration of detergent. The addition of water to this solution raises the level and reduces the concentration of the solution to a value usually employed in the particular washer. Further tumbling of the fabrics in this diluted, high level solution, readily separates the soils from the fabrics for suspension in the body of detergent and prevents redeposition of the soils in the fabrics. At the conclusion of the washing operation, the vitiated solution and suspended soils are removed from the drum. Conventional rinsing steps with or without centrifuging may next be carried out.

A further object of this invention is to facilitate the loosening of soils in fabrics being treated in a tumbler type washer and preclude the redeposition of the soils in the fabrics.

The invention will become more readily apparent from the following description of a preferred embodiment thereof shown by way of example in the accompanying drawing.

Figure 1 is a vertical longitudinal section taken through a domestic clothes washing and centrifuging machine and

Fig. 2 is a diagram of the electrical connections between the electrical elements shown in Fig. 1.

Reference will now be had to the drawings wherein the invention is disclosed applied to a machine for not only washing fabrics but also centrifuging washing fluid therefrom. This type of machine includes a washing and centrifuging unit generally indicated at 10 suitably suspended from a casing 11. The unit 10 includes as major elements thereof a tub 12, a basket or drum 13 arranged within the tub 12 for rotation about a generally horizontal axis, a multiple speed mechanism 14 and a main driving motor 15. As shown, the tub 12 and the basket 13 are generally cylindrical in configuration, the latter having a side wall 16 perforate substantially throughout its extent; a number of the perforations being indicated at 17. The front side of the basket is provided with a relatively large opening 18 permitting access to the interior of the basket. The basket 13 is also provided with a plurality of conventional, radially inwardly extending vanes, one of which is indicated at 19, for elevating and dropping fabrics during a washing operation as described hereinafter. The basket 13 is rotatably supported by the two-speed mechanism 14, the latter being carried by the rear wall of the tub 12.

The two-speed mechanism 14 is belted as shown at 21 to the motor 15 and is driven thereby. The two-speed mechanism 14 may be adjusted for high and low speed rotation of the basket by means of a magnet 22. Since two-speed mechanisms of the type shown at 14 are

so generally well understood, further description of the same is deemed unnecessary other than to state that, when the magnet 22 is deenergized, the basket 13 is rotated at a slow washing speed of, for example, 50 rpm, and, when the magnet 22 is energized, the basket is rotated at a centrifuging speed of, for example, 500 rpm.

The tub 12 is generally cylindrical in configuration and has a relatively large opening 23 formed in the front end wall thereof in registry with the opening 18 of the basket. The tub 12 is also provided with a sump indicated at 24 at the bottom thereof and communicating with the inlet of a pump 25 carried by the tub 12. As shown, the pump 25 has a flexible discharge conduit 26 which extends upwardly within the casing 11 to a point above the usual or normal water level in the tub 12 to prevent water from gravitating from the tub during the washing operation. It will be understood that, when there is a charge of washing water in the tub 12, the pump 25 and the portion of the conduit 26 below the water level in the tub are flooded. At this time, of course, the pump 25 is inactive. The pump 25 is driven by the motor 15 for the discharge of fluid from the tub 12 through a suitable clutch mechanism shown, by way of example, as a jaw-type clutch 27. The latter is actuated to its engaged position for the operation of the pump 25 by a magnet 28 when energized. When the magnet 28 is deenergized, a tension spring 29 actuates the clutch 27 to its open or disengaged position.

Washing water is admitted to the tub through a suitable conduit indicated as a flexible conduit 31. The latter is connected to a thermostatically operated water mixing device 32 of conventional construction, the latter receiving hot and cold water through conduits 33 and 34. The device 32 is provided with a valve (not shown) actuated by a solenoid 35 for controlling the flow of water from the device 32 to the conduit 31. The flow of water from the device 32 is controlled by the solenoid 35 which, when energized, effects the delivery of water to the conduit 31 and, when deenergized, prevents the flow of water thereto. As shown, a constant flow regulating device of any suitable construction and indicated at 36 is preferably connected in the conduit 31 in order that the flow of water therethrough is maintained substantially constant regardless of pressure changes. Since thermostatically operated water mixing devices of the type shown at 32 and constant flow regulating devices, as shown at 36, are so well understood in the art, further description of these devices is deemed unnecessary.

The washing and centrifuging unit 10 may be supported within the casing 11 in any suitable manner. These units, however, when

operated at high centrifuging speeds are usually flexibly mounted in order to prevent vibrations excited in the unit 10 from being imparted to the outer casing 11. The unit 10 shown herein may be flexibly suspended by springs which, however, are not shown for the sake of clearness and brevity and since they form no part of the present invention.

The casing structure 11 is provided with a relatively large opening 37 registering with the opening 23 in the tub and a flexible generally cylindrical wall indicated at 38, is employed to connect the tub 12 and the casing 11 to prevent the spillage of water within the casing 11 and, at the same time, to permit relative movement between the washing and spinning unit 10 and the casing 11. As shown, this resilient wall is formed of rubber or the like and extends through the openings 23 and 37. The ends of the wall are secured in any suitable manner to the front walls of the tub 12 and casing 11 peripherally of the openings 23 and 37. The flexible wall 38 encloses a passage 39 providing access to the basket 13, which passage 39 is closed by a door 41 hinged to the front wall of the casing 11 in any suitable manner, not shown.

In connection with the admission of washing water to the tub referred to heretofore, a float switch, generally indicated at 42, is employed for controlling the maximum amount of water which is admitted to the tub 12 for either washing or rinsing. This switch may be of any suitable construction, and as shown, includes a casing 43 enclosing a float chamber in which a float 44 moves upwardly and downwardly on a stem 45. When the maximum amount of water has been admitted to the tub, the float 44 engages an upper shoulder 46 on the stem 45 and moves a switch 47 to its open position. When the tub is devoid of water, the float 44 engages a lower shoulder 48 and actuates the switch 47 to its closed position. With the float 44 intermediate the shoulders 46 and 48, the switch 47 remains in the position to which it has been last moved. The switch 47 is connected in series with the solenoid 35 and controls energization of the latter all of which is well understood.

The various electrical translating devices referred to heretofore including the water valve solenoid 35, the main motor 15, the pump solenoid 28 and the speed change magnet 22 are sequentially energized and deenergized by means of a motor driven sequence switch, generally indicated at 51 and conveniently carried on the front wall of the casing 11.

The motor driven sequence switch or timer 51 is shown as a drum switch, the drum 52 of which is shown in development in Fig. 2 and movable in the direction of the arrow. The drum is manually actuated by a knob or handle 52 in order to initiate a cycle of operation as described later and also by means of a timer motor 54 of the type

commonly employed for driving clocks. The timer motor 54 includes a speed reducing mechanism (not shown) which rotates a shaft 55 at a relatively low speed of for example 1 revolution in approximately 35 minutes. A one-way clutch mechanism, diagrammatically shown at 56, is connected between the shaft 55 and the drum 52 in order to permit manual rotation of the drum 52 by the handle 53 relative the timer motor shaft 55.

As shown, the drum 52 carries a plurality of contact segments 57 to 70 inclusive which cooperate with stationary contact fingers 71 to 75 inclusive. A source of power for the apparatus is indicated by line conductors L_1 and L_2 , the former of which is connected to the contact finger 71 and the latter being connected to one terminal each of the float switch 47, the motor 15, the pump solenoid 28, the speed change magnet 22 and the timer motor 54. The opposite terminal of the float switch 47 is connected to a terminal of the water valve solenoid 35 the other terminal of which is connected to finger 72. The other terminals of the motor 15, the pump solenoid 28 and the magnet 22 are connected, respectively, to the fingers 73, 74 and 75. The opposite terminal of the timer motor 54 is connected to the finger 73 and defines a parallel connection between the motors 15 and 54.

Before describing a cycle of operation of the apparatus it will be assumed that the machine has a maximum charge of 10 gallons of water as determined by the float switch 42. This is usual for a machine of the type disclosed having a capacity of about nine pounds of dry fabrics. A detergency concentration of about .3% is employed for good washing operation and this can be obtained by the use of approximately 114 grams of powdered or flaked detergent. 25

A cycle of operation of the apparatus will now be described. In initiating the cycle, the fabrics are first disposed in the basket 13 along with the detergent and the door 41 is closed. The drum 52 is manually advanced from the "off" position as shown, to an active position wherein the segments 57, 58 and 64 are engaged with their respective fingers 71, 72 and 73. Since the segment 57 contacts the finger 71 throughout the cycle, all of the segments 57 to 70, inc. are energized at the potential of the line conductor L_1 . Engagement of the segment 58 and finger 72 energizes the water valve solenoid 35 through the float switch 47 and water, at a rate determined by the constant flow regulator 36, flows to the tub. The main motor is energized by the engagement of the segments 64 and 73 and operates to rotate the basket at its low washing speed at this time, it being understood that the speed change magnet 22 is deenergized. After about one minute operation of

the timer motor 54 the segment 58 and the finger 72 are disengaged for deenergization of the water valve solenoid 35. During this period of energization of the solenoid 35 just described, approximately 5 gallons of water is delivered to the tub for mixture with the detergent therein. Since this is about one half of the water utilized to complete the washing step, as described, hereinafter, a highly concentrated detergent solution of approximately six tenths percent is provided. It will be understood that the float switch 47 will remain closed as insufficient water has been admitted to the tub 12 to open the float switch.

Since a relatively low level of solution is present in the tub, at this time, the fabrics are somewhat compacted in this relatively small body of detergent. The rotation of the drum at 50 RPM at this time elevates and drops the fabrics in the body of solution and also effects a scrubbing action at the inner surface of the basket and the vanes 19 rotate in contact with the compacted body of fabrics. Furthermore, the highly concentrated body of detergent effectively loosens the soils in the fabrics assisted by the scrubbing action just described. The reduced quantity of detergent solution is insufficient to suspend all of the soils which may be present in the body of fabrics being treated at this time but this condition is corrected by the adding of water to the solution as will be now described.

The agitation and scrubbing of the fabrics in the low level, highly concentrated solution is carried out for about five minutes or until the segment 59 engages the contact finger 72. This operation again energizes the water valve solenoid 35 and the delivery of water to the tub is initiated. The flow of water continues until the float actuated switch 47 is opened in response to the presence of approximately 10 gallons of solution in the tub. The addition of five gallons of water to the five gallons of detergent solution already in the tub provides a solution having a concentration of about three tenths percent which is optimum for completing the washing operation.

During the tumbling of the fabrics in this increased body of detergent fluid, the fabrics are elevated by the rotating vanes 19 to an upper region of the basket 13 and then are projected across the basket into the body of detergent, providing a well understood and time proven washing action. It is pointed out at this time that the increased body of washing fluid is sufficient to suspend all of the soils which would normally be present in the fabrics being treated.

The washing operation is terminated by the engagement of the contact segment 65 and the finger 74, which operation energizes the solenoid 28 and the vitiated washing solution is discharged through the

conduit 26 to a suitable point of discharge. It will be understood at this time that the float-switch 47 is closed when substantially all of the water has been removed from the tub. A first rinse operation may be carried out by the engagement of the segment 61 and the finger 72 for about one minute during which a quantity of clean water is admitted for flushing off curds or any soils which may have remained on the fabrics or on the basket and tub structures. This first rinse water is discharged from the tub when contact segment 66 engages the finger 74 whereby the pump 25 is operated as described previously. During this operation of the pump, the high speed magnet 22 may be energized by engagement of segment 69 and finger 75 for effecting high speed operation of the basket and the centrifuging of the substantial quantity of the washing fluid from the fabrics.

A deep rinse operation may now be carried out by the engagement of the segment 62 and contact finger 72 energizing the solenoid 35 for the admission of rinsing water to the tub. The flow of water is terminated by the float switch 47 when a full charge of water has been admitted to the tub. The agitation of the fabrics in the rinse water, of course, dissolves any detergent present and also suspends any remaining soil. This body of rinse water is discharged from the tub by the engagement of the segment 67 and finger 74 and the operation of the pump. A second deep rinse similar to the one just described may be carried out by the engagement of the segment 63 and finger 72 and the consequent energization of the water valve solenoid 35. Again the float switch 47 is opened for terminating the flow of rinse water to the tub in response to the presence of a full charge of approximately 10 gallons of water in the tub.

The final operation is the discharging of the second body of deep rinse water and initiating the final centrifuging of the fabrics. The former operation is carried into effect by the engagement of the contact segment 68 and the finger 74, while the high speed operation is effected by the engagement of the segment 70 and the finger 75 and the consequent energization of the high speed solenoid 22. The cycle of operation is terminated by the disengagement of segments 52, 68 and 70 from the respective fingers 71, 74 and 75. The timer 51 is now in its inactive or "off" position as shown. The door 41 may now be opened and the damp dried fabrics removed from the machine.

While a machine for washing, rinsing and centrifuging of the fabrics has been disclosed by way of example, it will be understood that the invention is applicable to a machine which only washes fabrics with or without rinsing. The invention has been disclosed in connection with an automatic machine in its simplest form. Only apparatus

necessary for an understanding of the invention has been disclosed and such refinements as the use of multiple water temperatures during a cycle of operation, door operated switches, etc. have been omitted for the sake of brevity and clearness and since they form no part of the invention.

The claims defining the invention are as follows:-

1. Apparatus for washing fabrics or the like comprising a drum for containing a body of washing fluid and the fabrics to be treated, means for supporting the drum for rotation about an axis inclined substantially from the vertical, means for rotating the drum about its axis for tumbling the fabrics in the body of washing fluid, means for admitting a quantity of detergent to the drum at the beginning of a washing operation, time controlled means for admitting to the drum, at the beginning of the washing period, a fractional portion of the total body of water employed for the washing of the fabrics, said portion of the body of water and said quantity of detergent providing a detergent solution of relatively high concentration in which the fabrics are tumbled for a predetermined period of time, said time controlled means being effective at the conclusion of said predetermined period of time for admitting the remainder of the body of water to the drum for reducing the concentration of the body of detergent solution, said drum rotating means being operated under control of the time controlled means for tumbling the fabrics for a predetermined period of time in said body of detergent solution of reduced concentration and means for draining the detergent solution from the drum at the conclusion of the washing operation. (3rd August, 1954).

2. Apparatus for washing fabrics or the like, comprising a drum for containing a body of washing fluid and the fabrics to be treated, means supporting the drum for rotation about an axis inclined substantially from the vertical, means for rotating the drum about its axis for tumbling the fabrics in the body of washing fluid, means for admitting a quantity of detergent to the drum at the beginning of a washing operation, means including a water valve for admitting water to the drum, a timing mechanism controlling operation of the drum rotating means and said valve, said valve being opened by the timing mechanism at the beginning of a washing period to admit a portion of the total body of water used for the washing operation, said portion of the body of water and said quantity of detergent providing a detergent solution of relatively high concentration, said timing mechanism being then effect-

ive after a predetermined period of time to actuate the valve for the admission of the remaining portion of the body of water to the drum for diluting said solution, said drum rotating means being operated under control of the timing mechanism for the tumbling of the fabrics first in the highly concentrated detergent solution and then in the diluted solution, and means controlled by the timing mechanism for discharging the detergent solution from the drum at the conclusion of the washing period. (3rd August, 1954).

3. Apparatus for washing fabrics or the like comprising a drum for containing a body of washing fluid and the fabrics to be treated means supporting the drum for rotation about an axis inclined substantially from the vertical, means for rotating the drum about its axis for tumbling the fabrics in the body of washing fluid, means for admitting a quantity of detergent to the drum at the beginning of a washing operation, a conduit for conveying water to the drum and having a valve therein, a constant flow regulating device also connected in said conduit in series with the valve, a timing mechanism sequentially controlling operation of the drum rotating means and said valve to provide a series of steps in a washing program, said valve being opened by the timing mechanism at the beginning of a washing period for a predetermined period of time to admit a portion of the total body of water used for a washing operation, said portion of the body of water and said quantity of detergent providing a detergent solution of relatively high concentration, said timing mechanism being then effective after a second predetermined period of time to open the valve for the admission of the remaining portion of the body of water to the drum for diluting said solution, said drum rotating means being operated under control of the timing mechanism for the tumbling of the fabrics first in the highly concentrated detergent solution and then in the diluted solution, and means controlled by the timing mechanism for discharging the vitiated solution from the drum at the conclusion of the washing period. (3rd August, 1954).

4. Apparatus as claimed in any one of the preceding claims wherein the concentration of said highly concentrated body of detergent solution is of the order of 0.6% and the subsequent concentration of the body of detergent solution of reduced concentration is of the order of 0.3%. (3rd August, 1954).

5. Apparatus for washing fabrics or the like, substantially

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as hereinbefore described with reference to; and as illustrated in the accompanying drawings. (3rd August, 1954).

EDWD. WATERS & SONS.
SYDNEY.
Patent Attorneys for Applicant.

References:-

<u>Serial No.</u>	<u>Application No.</u>	<u>Classification.</u>
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151,430	37,188/50.	25.4; 04.2.
154,359	6386/51.	25.4.

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FIG. 1.

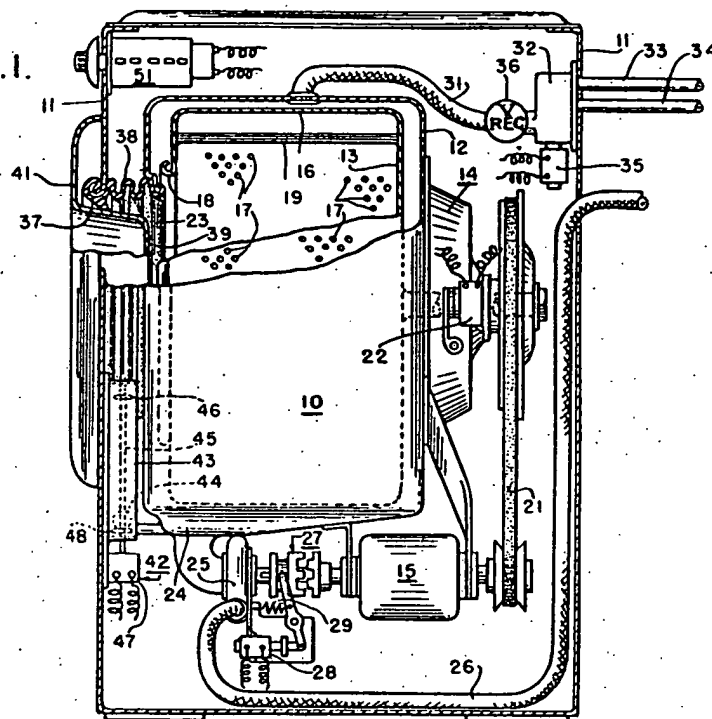
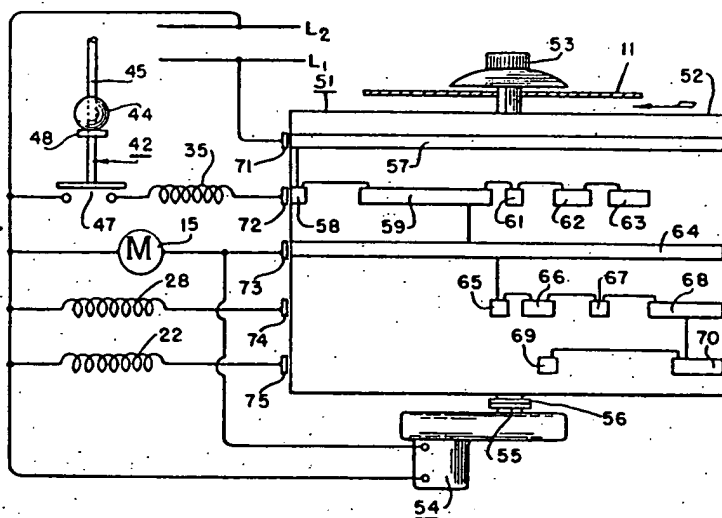


FIG. 2.



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